

# GLENOHUMERAL INSTABILITY AND GLENOID BONE LOSS IN A THROWING ATHLETE

Scott Mair, MD<sup>1</sup>

Christian Lattermann, MD<sup>1</sup>

Terry R. Malone, PT, EdD, ATC, FAPTA<sup>1</sup>

## ABSTRACT

This case presents the challenges of management associated with a young throwing athlete presenting with a history of bilateral anterior shoulder instability. This athlete had multiple surgical interventions over a three-year period. The imaging modalities provided partial elucidation (at best) of the true picture of the pathology. This case report outlines the decision making process utilized to provide individualized care to a young throwing athlete with bilateral glenohumeral joint instability, recurrent dislocations, and resultant glenoid bone loss.

**Level of Evidence:** 5 (Single Case report)

**Key Words:** Functional outcomes, shoulder instability, throwing shoulder

## CORRESPONDING AUTHOR

Terry Malone, PT, EdD, ATC, FAPTA  
Division of Physical Therapy- University of  
Kentucky  
Suite 204, Wethington Building  
900 South Limestone  
Lexington, KY  
40536-0200  
Email: Trmalol1@uky.edu

<sup>1</sup> University of Kentucky, Lexington, KY, USA.

---

## INTRODUCTION

Instability of the glenohumeral joint and its management has been discussed since time of Hippocrates.<sup>1</sup> The glenohumeral joint (GHJ) is diarthroidial, but requires a well defined fibro-cartilaginous labrum to enhance stability as the glenoid is relatively flat while the humeral head is spherical. This inherently unstable structure requires the synchronous functions of both active (muscular) and passive (ligamentous) structures. The throwing athlete is at risk for challenges to the GHJ. The high demands of the unique, repetitive process of throwing have the potential to alter both bony and soft tissues in order to enable throwing efficiency. Instability in the throwing athlete, thus, increases the difficulty in treatment as the required mobility seen in the thrower (increased external rotation and limited internal rotation) does impact the options for treatment.<sup>2</sup> The purpose of this case report is to outline the diagnostic path utilized to attempt to provide care for a young throwing athlete with bilateral GHJ instability and recurrent dislocation with subsequent glenoid bone loss.

### Case Presentation-Initial Visit

A 15 year-old male with a history of bilateral shoulder problems presented to the University of Kentucky Sportsmedicine Center for a second opinion in September 2010. He reported a history of instability problems in both shoulders. He initially injured his right shoulder about five months prior while sliding into second base. This was theorized to have been an anterior dislocation which spontaneously reduced. His pain resolved without additional assessment intervention and he returned to baseball in about one week after the initial event. He subsequently had two additional episodes while playing football, the most recent about a week before this visit. In all three events, he was able to self-reduce the GHJ.

The patient later experienced left anterior shoulder "instability" while playing dodge ball. During the initial consultation, the patient reported that both shoulders were pain-free, and that he did not experience night pain. The patient did not report any other issues with his shoulders other than the feeling of some apprehension when attempting to perform a tackle. He was a member of the varsity football team and the junior varsity baseball team.

His physical examination was unremarkable. He had full range of motion, no demonstrable generalized ligamentous laxity - no hyperextension at the elbows or wrists, no cervical tenderness/negative Spurling's maneuver, and no obvious posterior or anterior shoulder muscle atrophy or scapular dyskinesia. All impingement tests were negative and all strength tests equal (well within expected levels 5/5 bilaterally). He did demonstrate a 1.5 cm sulcus sign bilaterally. He did not demonstrate a positive apprehension sign on either extremity but there did appear to be some possible muscle guarding - probably related to the recent episodes of instability. He demonstrated the classic loss of internal rotation range of motion of approximately 15 degrees on his throwing extremity, as compared to his non-dominant extremity.

Diagnostics: Plain film radiographs were interpreted as normal. The patient brought his recently completed magnetic resonance images (MRI) of both shoulders, which demonstrated a Bankart lesion on the right and a possible, subtle, Bankart lesion on the left. Neither shoulder demonstrated Hill-Sachs lesions or evidence of bone contusions, which was interesting, as he had experienced possible dislocation episodes in both shoulders within the previous 10 days. There was no evidence of any other pathology.

In light of the imaging and clinical presentation, the patient and family were given options for care. Since the symptoms were bilateral and he was 15 years of age, he was told that he had nearly a 100% chance of having additional (recurrent) dislocations if he continued to play contact sports. Since at that time, the diagnostic images indicated primarily limited soft tissue changes, and because he was a thrower, the recommendation was made that an arthroscopic Bankart procedure of the right shoulder would probably be his best option and a similar recommendation was made for the left shoulder.

### Follow-up Visit #1

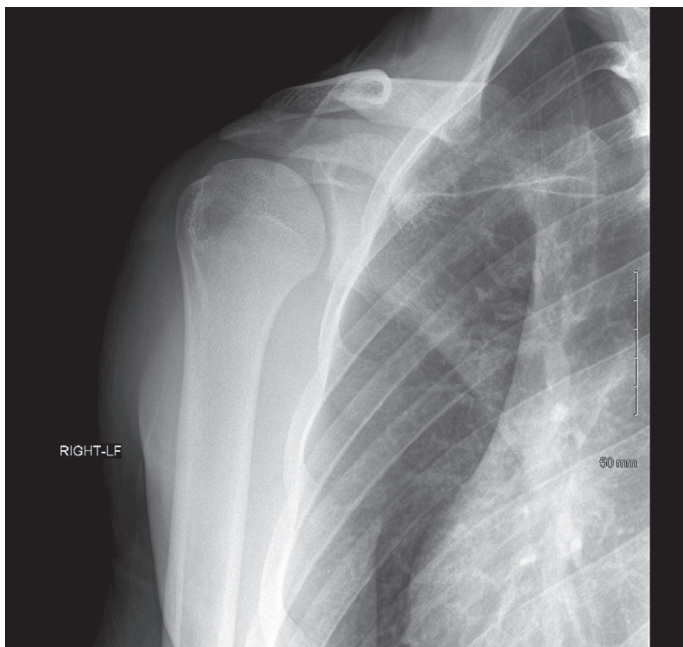
The subject returned at age 16 (entering his junior year of high school), to the sportsmedicine clinic related to recurrent right shoulder instability. He had bilateral arthroscopic Bankart repairs performed in September of previous year at another facility. He stayed out of athletics for six months and was appropriately rehabilitated to enable his return to baseball. He did

relatively well but did have one minor subluxation type of episode while playing during his return season. He has started playing football and sustained a frank anterior dislocation incident when blocking during practice. He was again able to self-reduce through rotation and muscle activation.

Physical examination provided a similar presentation to that seen during his previous visit of one year earlier. He did have a mild apprehension response on the right shoulder and the arthroscopic portals were well healed bilaterally.

Plain film radiographs were procured, and were interpreted as essentially normal reading, with no bony changes clearly evident (Figures 1 and 2). A recently completed external MRI with injected contrast was supplied during this visit to further enable diagnostic delineation which revealed a recurrent Bankart lesion on the right and some level of an anterior/inferior bone defect of the glenoid, also on the right (Figures 3 and 4).

Since football season had started, he was instructed to continue his shoulder strengthening but refrain from any football practice until a more complete recommendation for care evolved. He was to come back to the clinic as soon as he had procured cop-



**Figure 1.** The anterior-posterior view of the right shoulder reveals no bony abnormality or bone loss at the anterior-inferior aspect of the glenoid fossa (August 2011).



**Figure 2.** The axillary view also fails to allow visualization of any bony contribution to this patient's instability issues. Note the anterior glenoid rim is difficult to appreciate in detail because of the superimposition of other structures (August 2011).



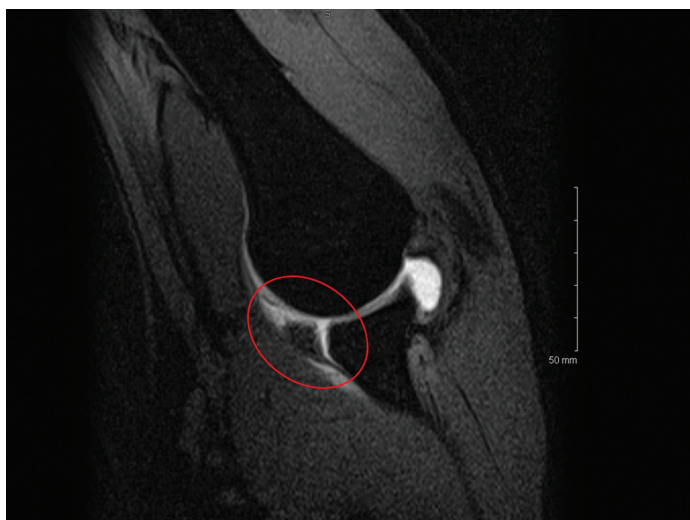
**Figure 3.** In this axial T1-weighted MRI with injected contrast, the defect anteriorly is clearly visible. The discontinuity of the anterior capsuloligamentous structures and glenoid are evident (August 2011).

ies of the MRI from previous year and his operative notes (and any arthroscopic pictures which might be in his medical record) from the previous surgeon.

### Follow-up visit #2

The patient reported no additional episodes of instability. He indicated that if throwing, he felt soreness





**Figure 4.** *This T1-weighted axial MR slice while the shoulder is positioned in each 90 degrees of abduction and external rotation further demonstrates the extent of the osseoligamentous disruption anteriorly. Note the contrast filling the cleft formed by the avulsion of the anterior glenoid fossa (August 2011).*

after but it did not stop him from throwing. The previous MRI and reports of surgery were compared to the recent MRI but revealed only a slight amount of glenoid bone wear which did not appear to be overly abnormal. A recurrence of the Bankart lesion was evident, repair of which had been accomplished with two bone anchors that appeared to have been reasonably placed.

As a recurrent dislocation of the right shoulder had definitely occurred, surgical intervention was recommended as the best option. The subject was told he could attempt to continue athletics (football and baseball) but with at least a 50% chance of recurrence over the next couple of seasons if he did not have surgery. He was scheduled surgery, after he and his family were provided with all options including: continuing rehabilitation alone; not playing football but continuing with baseball; playing both; giving up both; choosing surgery and the timing of surgery.

### Follow-up visit #3

The patient indicated that he was continuing to complete his rehabilitation and was throwing, but not playing football. He did describe some superior/posterior pain with throwing but no other obvious symptoms were present. He reported not having any instability episodes since prior to his previous visit approximately one month earlier.

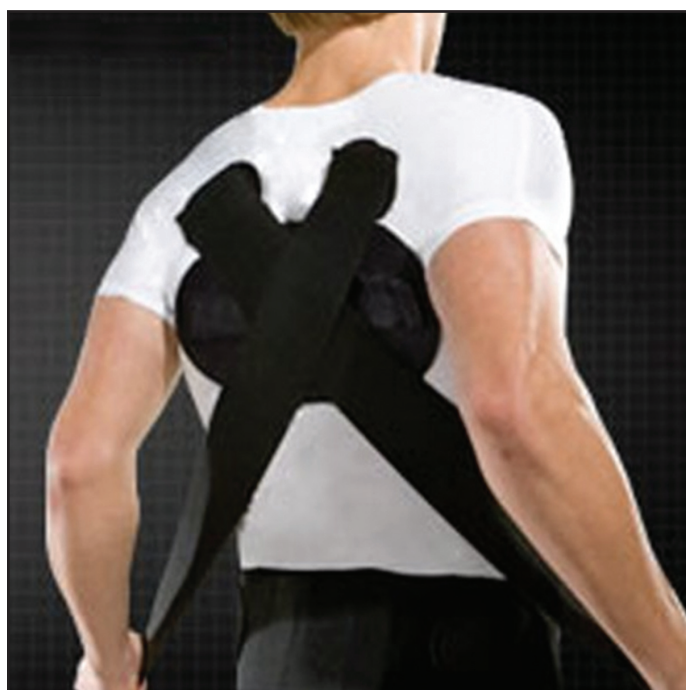
Because of his inflamed state, he was placed on Diclofenac to assist with the superior/posterior pain and was to return in one month for follow-up. He continued his rehabilitation and throwing progressions reviewed and known to him as they were previously used following his arthroscopic Bankart procedures performed 14 months previously.

### Follow-up Visit #4

The patient reported continuing improvement with his throwing progression. His next follow-up visit was scheduled for two months.

### Follow-up Visit #5

This visit occurred earlier than planned, because the patient had experienced right anterior shoulder instability while playing badminton, basketball, and then with throwing—all within the 7 days prior to this visit. Since he experienced multiple episodes in a short time frame, he was referred to physical therapy in order to provide a well-defined program to be followed during the next month. He was instructed to return to the clinic in one month and to let the therapists guide and direct his activities. It was determined that he was going to try the shoulder stabilization shirt (Figure 5), which was intended to facilitate muscle activation.



**Figure 5.** *Example of a stabilization type shirt.*

### Follow-up visit #6

Patient returned and confirmed continued difficulty with throwing. Although he played second base, he had significant problems attempting to make the required throws. Due to the fact that he continued to have problems and had become very frustrated – discussion ensued related to the best surgical options. The patient was informed that a Latarjet procedure would be the best surgical option.

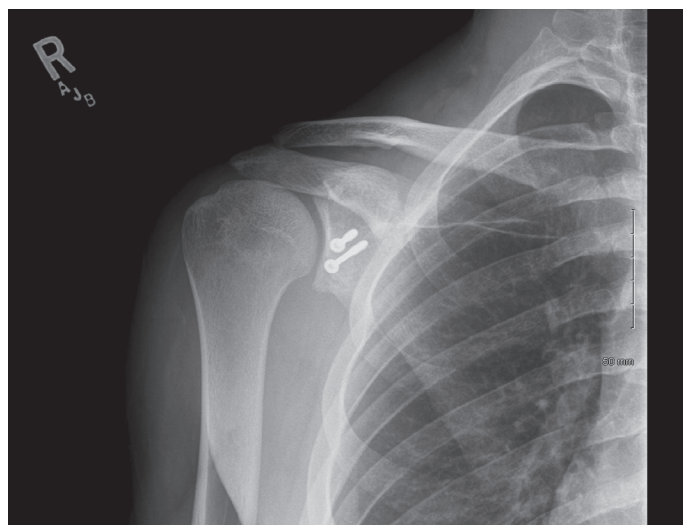
The Latarjet was viewed as reasonable compromise because it should provide the required soft tissue stability as well as the bony -reconstruction of the glenoid fossa while providing a viable opportunity for the athlete to maintain reasonable throwing mechanics (by not significantly decreasing his external rotation range of motion). This surgery was first described by Latarjet as a modification of the classic Bristow procedure. The modification was the addition of screw fixation of the transferred tip of the coracoid to the glenoid rim. Hovelius has provided an excellent synopsis of these modification issues, including a 17-year follow-up of both Bankart and Bristow-Latarjet patients.<sup>3</sup>

The patient and family made the decision to proceed with the Latarjet procedure, but surgery was deferred until the conclusion of the subject's baseball season. The subject continued to play baseball (with symptoms) until the completion of his junior varsity season.

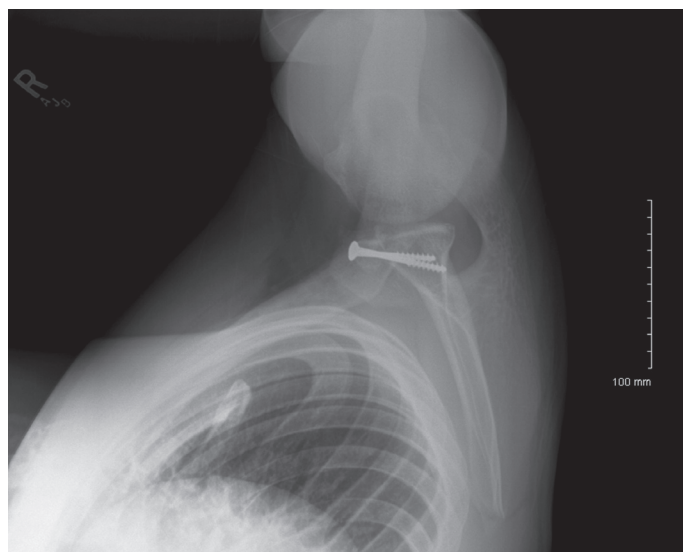
### Surgical Data – Latarjet Procedure

The Latarjet procedure was performed on the right GHJ. Interestingly, although previous MRI had shown only minimal bone loss, a significant loss (35%) of anterior/inferior glenoid bone loss was identified during surgery. This emphasizes the difficulty in gaining an accurate estimation of bone loss via imaging in this region – requiring the surgeon to have suspicion of greater involvement than that often described radiographically. The post-operative plain films demonstrate the contoured portion of the coracoid stabilized by two threaded screws (Figures 6 and 7).

As rehabilitation is not the focus of this case report, only a brief outline of his post-operative care is provided. The subject completed an uneventful post-operative course, using a sling for three weeks during the initial precautionary period. He then progressed to scapular control and core work early,



**Figure 6.** An anterior-posterior view of the right shoulder following the Latarjet procedure, revealing the anchors used for bony stabilization (June 2012).

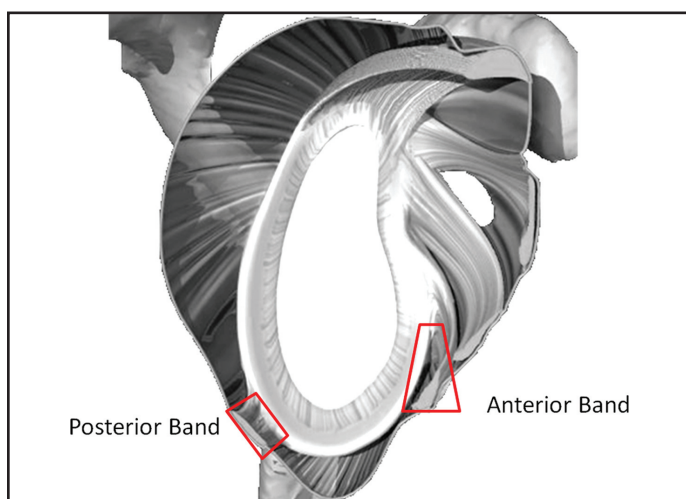


**Figure 7.** An axillary view of the right shoulder, also demonstrating the anchors used for bony stabilization (June 2012).

before advancing to GHJ motion and additional stabilization interventions. He returned to a throwing progression at 12-14 weeks post-operative and has returned to full baseball activities at five months without recurrence of instability. He had a sensation of tightness of internal rotation, but it did not limit his return. Objectively, he lost approximately 5-8 degrees of external rotation- which is consistent with previous reports.<sup>3</sup> Overall, the subject is quite happy with his outcome.

## DISCUSSION

The evaluative progression and subsequent management of this throwing athlete with bilateral GHJ instability demonstrates how difficult the diagnostic process is for these patients and how great discretion is required. The performance of bilateral arthroscopic Bankart procedures initially, appears to be consistent with many surgeons' recommendations for this patient presentation/history. The recurrence of instability in the right throwing shoulder may have been related to many issues. It is possible that some bone loss was present at the initial surgery but it was not significant (as seen at arthroscopy and via imaging) or that the athlete's return to throwing created forces that led to recurrence of or continued progression of bone loss. Traditional orthopedic management of these individuals typically is centered on gaining stability – with less concern for maintenance of function. Unfortunately, performing a procedure that significantly limits motion (while providing stability) may not allow a throwing athlete to return to their activities. Much of the thought related to the function of the capsular restraints has been built through the classic work of O'Brien.<sup>4</sup> This work provided the concepts of the inferior capsule and anterior/posterior capsular ligaments or bands – the required attachment and tensioning of which remain a critical part of surgical technique today. Figure 8 provides a representation of these structures. Unfortunately, the surgical approach used in this case (originally) of re-establishing the only the anterior inferior band or restraint was not successful.



**Figure 8.**

Numerous traditional non-anatomic GHJ joint reconstructions have been performed, nearly all of which provided stability but often resulted in constraint of motion that led to the adoption of more anatomic procedures.<sup>5,6,7</sup> This has been especially true for younger throwing athletes as they increasingly expect to be able to return to throwing.<sup>3,6,7,8</sup> The selection of the Latarjet procedure for the athlete discussed in this case report was related to perceived anterior/inferior glenoid bone loss and the athlete's desire to return to throwing. A relatively long-term study of this was published that demonstrated significantly less loss of external rotation with the Latarjet procedure as compared to other procedures.<sup>3</sup> Also this athlete's bone loss (probably related to his continued recurrent instability episodes) required correction, as outlined by Bhatia et al.<sup>9</sup> Quite interesting was the level of glenoid bone loss which was not able to be well delineated through diagnostic imaging, including a MRI. Bony overlap and a difficult area to visualize make this a diagnostic challenge.

## CONCLUSION

This case presented the difficult path of care for a young throwing athlete who experienced bilateral glenohumeral shoulder dislocations. Young throwing athletes who wish to continue their sports despite episodes of instability remain a challenge for all involved clinicians. This is particularly true as their expectations regarding the ability to return to throwing continue to increase. An additional consideration in athletes such as the subject of this case is decision making related to in-season versus post-season conservative and surgical management. This facet may further complicate the final decision made by the athlete and the treating clinicians.<sup>10</sup>

## REFERENCES

1. Adams FL. *The Genuine Works of Hippocrates, Vols. 1 and 2*. New York: William Wood; 1886.
2. Cavallo RJ, Speer KP. Shoulder instability and impingement in throwing athletes. *Med Sci Sports Exerc.* 1998;30(4 Suppl):S18-25.
3. Hovelius L, Vikerfors O, Olofsson A, Svensson O, Rahme H. Bristow-Latarjet and bankart: a comparative study of shoulder stabilization in 185 shoulders during a seventeen-year follow-up. *J Shoulder Elbow Surg.* 2011; 20:1095-1101.
4. O'Brien SJ, Neves MC, Arnoczky SP, Rozbruch R, Dicarlo EF, Warren RF, Schwartz R, Wickiewicz TL.



- 
- The anatomy and histology of the inferior glenohumeral ligament complex of the shoulder. *Am J Sports Med.* 1990;18:449-456.
5. Torg JS, Balduini FC, Bonci C, Lehman RC, Gregg JR, Esterhai JL, Hensal FJ. A modified Bristow-Helfet-May procedure for recurrent dislocation and subluxation of the shoulder. Report of two hundred and twelve cases. *J Bone Joint Surg Am.* 1987;69:904-13.
  6. Ahmad CS, Wang VM, Sugalski MT, Levine WN, Bigliani LU. Biomechanics of shoulder capsulorrhaphy procedures. *J Shoulder Elbow Surg.* 2005; 14(1 Suppl S):12S-18S.
  7. Kiss J, Mersich I, Perlaky GY, Szollas L. The results of the Putti-Platt operation with particular reference to arthritis, pain, and limitation of external rotation. *J Shoulder Elbow Surg.* 1998; 7:495-500.
  8. McCarty EC, Ritchie P, Gill HS, McFarland EG. Shoulder instability: return to play. *Clin Sports Med.* 2004;23:335-351.
  9. Bhatia S, Ghodadra NS, Romeo AA, Bach BR, Verma NN, Vo ST, Provencher MT. The importance of the recognition and treatment of glenoid bone loss in an athletic population. *Sports Health.* 2011; Sep;3(5):435-40.
  10. Buss DD, Lynch GP, Meyer CP, Huber SM, Freehill MQ. Nonoperative management for in-season athletes with anterior shoulder instability. *Am Journal Sports Med.* 2004;32:1430-1433.